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Fire & Soil

Soil Study

Soil is an essential part of the ecosystem. It is made up of organic material, water, air and billions of organisms. Soils are formed from parent rock that erodes into smaller and smaller particles, both coarse and fine. These particles, deposited by water and wind, are classified by their size from the finest (clay) to the more coarse (silt) to the coarsest (sand). Loam is a soil that is a mixture of all three. The water-holding capacity of soil determines its type, with the finest soils holding water and the coarser ones allowing water to percolate through.

Soil depth worldwide averages only six inches (fifteen centimeters). Soil and its underlying layers form horizons from the surface to the bedrock. These layers are distinct from one another chemically and physically because of their distance from the surface. For example: the top layer of soil is composed primarily of organic material, such as leaves and insects. The second layer, or topsoil, is where seeds germinate and plant roots thrive. The next layer is usually composed of sand and silt, with minerals and clay having been removed and settled into the next layer. Beyond this, the layers usually consist of rocks with little organic matter. The soils of this area tend to show a horizon with a moderately weathered topsoil layer, and subsurface layers of clay.

Soils play an important role in the plant communities of an area. Soils of the Santa Monica Mountains, range from thick, well-drained loams of oak-covered valley bottoms, to areas of chaparral where the soil is rocky, shallow, and lacking in minerals. This type of soil holds little moisture and tends to be dry. The plants of the Santa Monica Mountains have adapted to the soils of their area, which maintain a certain moisture level, nutrient level, and pH level, suitable to the needs of these plants.

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Soil pH is an important factor in the survival of plants. The pH refers to the measure of acids and bases in a substance. Substances that produce hydrogen ions are called acids (H^+) and substances that produce hydroxyl ions (OH^-) are bases. When combined they form water (H_2O), and are neutralized. A pH scale describes the acids and bases in a substance. A pH number of 7 is neutral—neither acid or base. Below 7 are acids; above 7 are bases. Most species live in a moderately acidic environment, where soil and water pH range from 5.5 to 6.5. Most of the nutrient minerals that plants take from the soil are bases, which leaves the soil more acidic.

Fire affects both the ground above and below the surface of the soil. Soil moisture content, the amount of organic matter present, and the duration of the fire determine how soil will be affected. Severe fire can affect soil fertility causing nitrogen, phosphorus, and potassium to increase or even vaporize! After a fire, the basic minerals of the plants are converted into ash. The content of the ash causes a pH change, and the soil becomes more alkaline or basic. In some plant communities, this would cause different species of plants to grow. In the chaparral community, the ash stimulates plant germination with fire-following annuals (chaparral plants that sprout after a fire.) Because of its recovery potential through fire-germinated seeds, root-crown sprouting, and deep root systems, the plants of the chaparral return, rather than a new plant community succeeding it.